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TITLE: IMAGING MODALITIES RELEVANT TO INTRACRANIAL PRESSURE ASSESSMENT IN ASTRONAUTS:
A CASE-BASED DISCUSSION

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ABSTRACT BODY:

Introduction: Intracranial pressure (ICP) elevation has been inferred or documented in a number of space crewmembers. Recent advances in noninvasive imaging technology offer new possibilities for ICP assessment. Most International Space Station (ISS) partner agencies have adopted a battery of occupational health monitoring tests including magnetic resonance imaging (MRI) pre- and postflight, and high-resolution sonography of the orbital structures in all mission phases including during flight. We hypothesize that joint consideration of data from the two techniques has the potential to improve quality and continuity of crewmember monitoring and care.

Methods: Specially designed MRI and sonographic protocols were used to image eyes and optic nerves (ON) including the meningeal sheaths. Specific crewmembers' multi-modality imaging data were analyzed to identify points of mutual validation as well as unique features of complementary nature.

Results and Conclusion: Magnetic resonance imaging (MRI) and high-resolution sonography are both tomographic methods, however images obtained by the two modalities are based on different physical phenomena and use different acquisition principles. Consideration of the images acquired by these two modalities allows cross-validating findings related to the volume and fluid content of the ON subarachnoid space, shape of the globe, and other anatomical features of the orbit. Each of the imaging modalities also has unique advantages, making them complementary techniques.

Learning Objective 1: To review the morphological changes in orbit structures caused by elevated ICP, and their imaging representation.

Learning Objective 2: To learn about the similarities and differences between MRI and sonographic imaging of the eye and orbit.

Learning Objective 3: To learn about the role of MRI and sonography in the noninvasive assessment of intracranial pressure in aerospace medicine, and the added benefits from their combined interpretation.

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